To Remove Iron Rust.

The engineer who is so unfortunate as to have a portion of his engine become rusted, or the more fortunate man who takes charge of an engine which has been neglected and is covered with rust, finds before him a tedious job in cleaning and getting the metal to again present a polished surface. Rust, chemically considered, is an oxide of iron when it appears on iron or steel, but the combination of oxygen and any other metal will form a rust, although in such cases it is usually given another name. The combination of oxygen with iron can only take place to an appreciable extent in the presence of moisture or hydrogen, and if extensive leaves little depressions in the metal when the rust is removed. This occurs from the fact that when the oxygen combines with the iron, that portion of the iron forming the combination is loosened or separated from the mass. There are two ways in which rust may be removed from iron or steel. The first and most common practice is by the use of some abrasive material, and the process is usually termed scouring. Another method is by chemical action, by the application of some chemical applied in solution, which has a high affinity for oxygen and which withdraws the oxygen, leaving the iron particles free.

One of the best compounds for such purposes is given by the *Chronique Industrielle* as follows: Potassium cyanide 15 grammes, soft soap 15 grammes, whiting 30 grammes, and sufficient water to form the ingredients into a paste. This is to be applied as a scouring material and well rubbed over the rusted surface, after which it is to be thoroughly wiped off and a coating of oil applied to stop further action. The active material in this composition is the potassium cyanide, which has the strongest deoxidizing property of any substance with which we are acquainted; and further, it is one of the most poisonous substances known, the base being potassium, which is combined with cyanic acid, and cyanic acid is so poisonous that it is extremely dangerous to use in any manner unless partially neutralized by combination with some other substance, as in the present case.

Cyanic acid is of itself a gas, and in this condition it is extremely destructive to life, the inhalation of even a small quantity being sufficient to cause instantaneous death. When in solution in water the liquid is called hydrocyanic acid, a single drop of it, if taken internally or entering the system in any manner, being sufficient to cause death within the short space of two seconds of time.

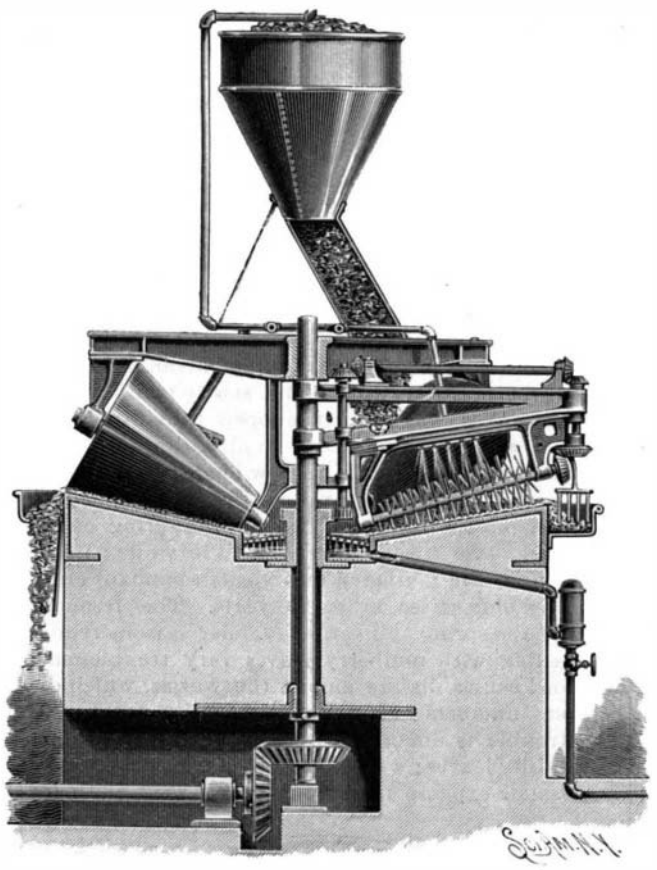
No particular danger is to be apprehended from the use of the composition given for removing rust, as the addition of soft soap, which is of equal weight with the cyanide of potassium, goes far to counteract the acridity of the cyanide. Then the further addition of whiting in double the amount of cyanide reduces the strength of the compound so much that it is relieved of the greater part of its dangerous properties.

If any one attempts to make use of this compound for scouring purposes, we would suggest that he do so only when the hands are free from abrasions of any kind, as if it should come in contact with any portion of the flesh where the skin is removed a very bad sore would probably be the result.—*Stationary Engineer*.

Corn Beer.

The *Handels Museum* of July 2 states that a new brewery product, namely, beer made from maize, is being manufactured and consumed in increasing quantities in France. The cost of production is said to be much below that of beer made from barley, notwithstanding that the beer itself is in no way inferior to the latter.

The new beverage is not the result of any improved process, but is made by malting maize, of which it is a pure product, and not (as is done in some districts) the result of mixing maize meal with the worts of barley malt. Owing to the high price of malt, brewers have for a long time been driven to use unmalted cereals for brewing purposes. Experiments have been made with wheat, maize, rice, potato meal, maize sirup, etc.; in such cases there was an insufficient development of the saccharin principle, and, owing to a lack of soluble nitrogenous bodies, fermentation did not proceed satisfactorily. Hence the beer became spoiled by a second fermentation, and further there was a lack of albuminous matter and phosphates, which constitute the nutritive properties of beer. These defects are all said to be remedied by using maize malt.

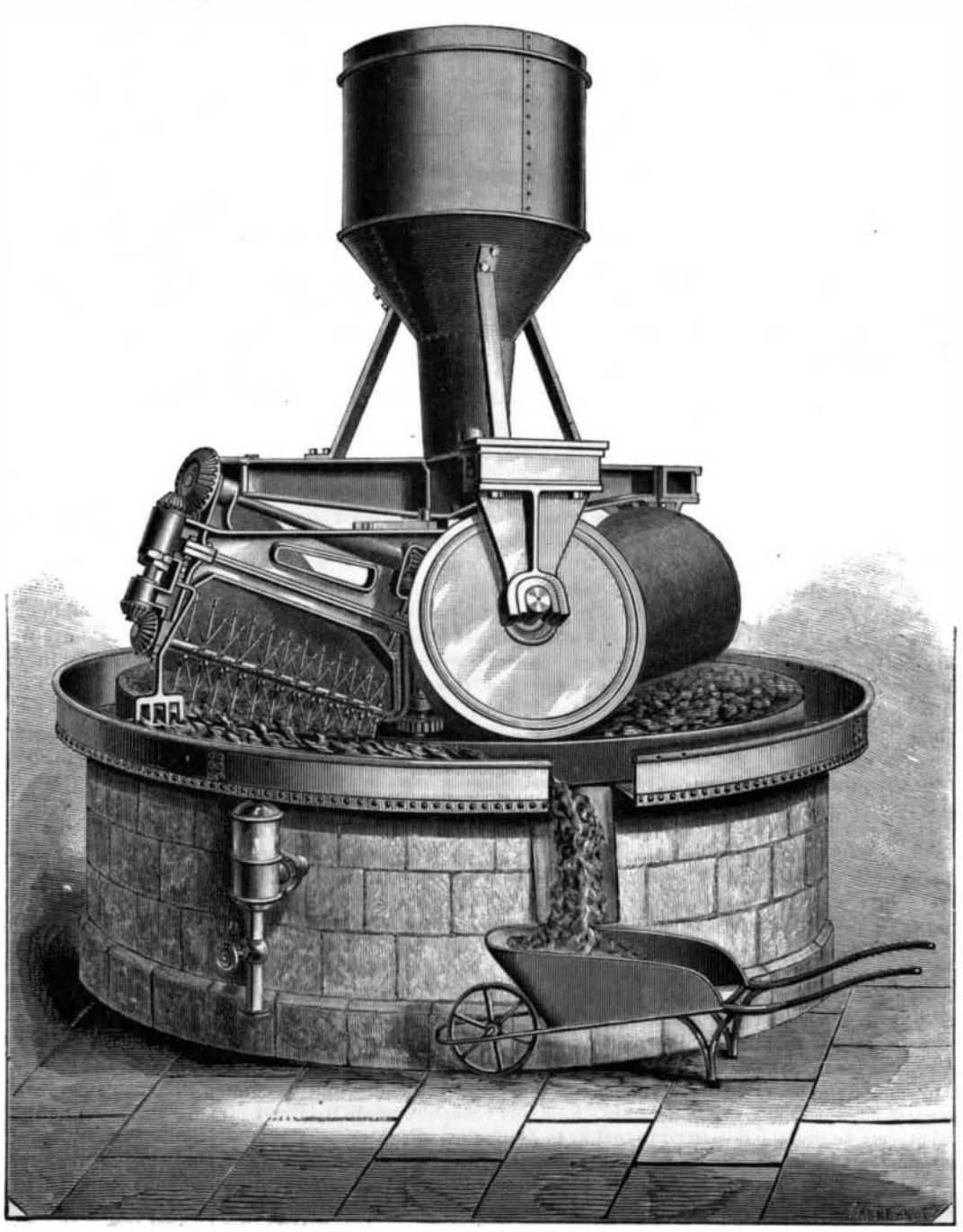


WASHING AND EXTRACTING MILL—SECTIONAL VIEW.

AN IMPROVED FIBER TREATING MILL.

Messrs. Gabriel Castaños and Guadalupe Lopez de Lara, two Mexican engineers, have invented and introduced the fiber crushing, washing, and extracting mill shown in the accompanying illustrations, which has already been successfully employed in Mexico in the treatment of the maguey plant, whose fiber is an excellent substitute for hemp, and from the fermented juice of which is made a sort of brandy called mezcal. For the proper treatment of this plant, the dextrine juices of which are converted into glucose during the preliminary operations, it is necessary to thoroughly disintegrate and separate the fiber, at the same time washing it efficiently, to extract all the juice containing glucose, and the methods of doing this work heretofore employed by Mexican manufacturers have been most rudimentary and imperfect. The mill we illustrate is said to satisfy all the conditions of a good machine, giving sure and satisfactory results, and it is claimed that it may be advantageously employed for the extraction of the juice of all kinds of fruits, for oil and the separation of the fiber, in the manufacture of sugar from beets, and in all industries connected with the treatment of pulpy or fibrous materials.

The annular bed plate of the mill has a central depressed basin, with a perforated cover or strainer. The juice, running into this basin as the mill is operated, is conducted by a pipe to a receiver at one side, and there is a central sleeve fixed in the basin affording a journal box for a vertical shaft connected by bevel gears with a horizontal driving shaft. The vertical shaft carries at its upper end a three-armed spider-like frame, each arm of which has depending hangers, the hanger at the inner end of each arm being connected with a collar fitting on the vertical shaft, and the hangers having boxes which receive the journals of conical rollers, rolling upon and rotating around the axis of the bed plate. Fixed to the vertical shaft immediately below the spider is an arm with depending brackets carrying a cone-shaped brush, the ends of the bristles just reaching the bed plate and the bristles being preferably of wire, although the construction of the brush may be modified to adapt the machine to the treatment of different substances. The brush is hung in the machine with the base of the cone outward, and its axis is at an angle to the arm on which it is hung, so that as it revolves it forces the material gradually toward the outer edge of the bed plate. The angle of inclination of the brush can, however, be easily changed, to move the fresh material more or less rapidly to the outside. With the brush at its greatest inclination twenty-five revolutions are required to remove the material from the bed plate, and during this operation it will be pressed upon an equal number of times by each of the revolving conical rollers, the squeezing pressure being thus seventy-five times repeated on all portions of the material. A longer period of treatment may be obtained by changing the inclination of the brush, which may be so arranged as to move the material only in a circle, where it will be kept continuously under the rollers as long as may be desired, and will not be moved toward the outside at all until a change is made for that purpose. The revolution of the brush is effected by means of a vertical shaft having a pinion on its lower end meshing with teeth on the upper end of the sleeve in the central basin, a beveled pinion on the upper end of this shaft meshing with another pinion on a horizontal shaft on the brush-supporting arm, at the outer end of which is a short vertical shaft with bevel gear connecting with the outer end of the brush shaft, so that as the brush-supporting arm swings around, the brush shaft will be revolved. The material, cut in pieces of the desired size, is delivered from the hopper to the central portion of the bed plate, and water is supplied as may be necessary,



THE CASTAÑOS AND LARA FIBER CRUSHING WASHING AND EXTRACTING MILL.

either cold or hot, according to the character of the fiber. Maguey juice is very heavy, having about the consistency of sirup, and it is necessary to supply water to thin the juice so that it will flow readily, the juice also being more easily extracted when the material is thoroughly wet. Simple appliances or accessories can be readily added to keep the temperature of the machine, or its bed plate and rollers, comparatively high, should this be deemed advantageous in the treatment of some kinds of material. The water supply pipe is connected with a circular pipe mounted on the spider, as fully shown in one of the views, and extending laterally from this pipe are bent branches having at their outer ends suitable jets which spray the water upon the bed plate near the rollers. The supply pipe is bent inwardly above the hopper, so that its axis will align with the central shaft, and it may revolve with the hopper on which it rests. A trough extends around the outer edge of the bed, in which travels a fork supported from a bracket on the outer end of the brush-supporting arm, and at one point in the trough is a suitable opening for the discharge of residuum, the fork pushing along the material forced outward by the brush, after the juices have been thoroughly extracted, and a barrow or other suitable receptacle being placed under the opening to receive it.

These mills are being manufactured by Messrs. Robert Deeley & Co., of New York City, and further particulars may be obtained by addressing Messrs. Fred'k Probst & Co., No. 51 Broad Street, New York City, or Mr. Gabriel Castaños, Apartado de Correo 43, Guadalajara, Jalesco, Mexico.

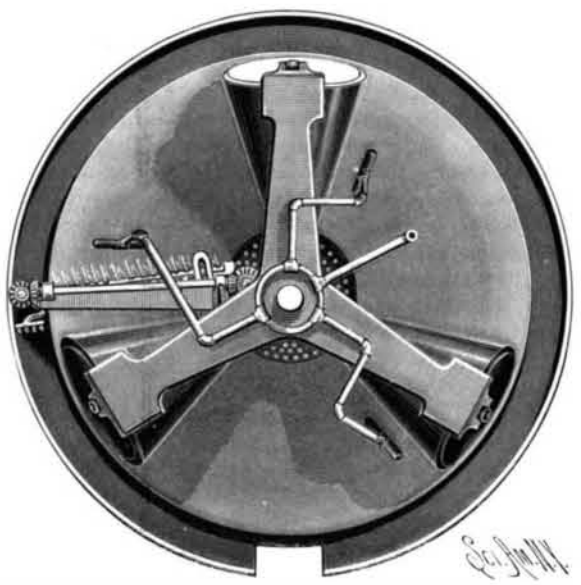
Experiments in Sericulture in Germany.

One of the reasons why the propagation of the silk worm (Bombyx mori) north of the Alps has gradually decreased to almost nothing is the want of suitable food for it, as the white mulberry tree, whose leaves furnish the best nourishment for the worm, does not well grow in the climate of Central Europe. Repeated experiments have been made, therefore, in Germany to feed the silk worm with other than mulberry leaves, but most of them proved failures. It seems, however, that renewed experiments, which were undertaken at Munich, have been fairly successful, and as the climate of the Middle and Eastern States is about the same as that of Central and South Germany, it may be of interest to American sericulturists to communicate the report of the *Augsburg Allgemeine Zeitung* of a lecture delivered on the subject at the centennial celebration of the Munich Veterinary Academy by Professor C. O. Harz, as follows:

By preliminary experiments with various races of the mulberry silk worm it had been ascertained as early as 1885 that the worm may be compelled by hunger to eat the blossoms and leaves of several indigenous plants, especially of those of dandelion and salsify (Scorzonera hispanica) and that it can for some time subsist upon them, especially if mixed with mulberry leaves, and that several worms which had for four weeks kept alive on this food, although with very little growth, when afterward fed with mulberry leaves alone, produced normal cocoons nevertheless. Another experiment was made in 1886 with the yellow Milan worms and leaves of salsify for food, which, however, had again to be replaced by mulberry leaves toward the close of the feeding period, with the result that out of 1260 worms, 14 cocooned. The cocoons of these worms were lighter, the threads spun by them thinner and weaker, than those of the original Milanese, but from most of them well formed moths were obtained, which produced 389 eggs. In the following year (1887) 357 little worms issued from these 389 eggs, which were now fed with salsify leaves alone, giving 27 cocoons, from which 26 moths were developed, which laid 1646 eggs. The thread of this generation, which had been exclusively fed with salsify leaves, was decidedly stronger than that of the preceding one, which had still partly been fed with mulberry leaves. In 1888 nearly all the 1646 eggs hatched, the first 1140 were again raised on scorzonera leaves alone, and yielded 338 normal cocoons, whose thread was in strength nearly equal to the original Milanese silk. It broke by a weight of 5 grammes, while the normal thread resists a weight up to 6 grammes. Moths were obtained from nearly all the cocoons, and laid 18,000 eggs. About 9,000 of these eggs were in 1889 again hatched in the incubator at 25° C. and the 3,700 worms issued in the first three days were taken to be raised. Although the cold and damp weather and scarcity of food acted unfavorably, Dr. Harz obtained after 33 days 755 cocoons, whose easily reeled thread was in length and strength equal to that of an average crop.

The fact was achieved, therefore, by four years' culture from generation to generation, to render the true silk worm, Bombyx mori, so far accustomed to exclusively subsist on the leaves of salsify as to multiply and yield a cocoon fiber which is nearly equal to that obtained by mulberry food. The cocoons produced in the fifth year, 1889, on the whole left little to wish as regards size and weight; the largest one weighed 1·39 grammes, the silk thread attained a length of nearly 300 meters, its diameter is exactly that of the original Milanese silk thread, it has the same tensile strength as the latter, breaking only at a load of 5—6 grammes. The gloss of the fiber is exactly that of the normal thread of the mulberry worm. The latest season (1890) of the culture of this new race of silk worms, as Dr. Harz states, again resulted in satisfactory progress; 34·2 per cent of the worms exclusively fed scorzonera leaves yielded normal cocoons; while the heaviest of the preceding year weighed 1·39 grammes, those of this year weighed 1·83 grammes; their thread was in gloss or tensile strength completely equal to the ordinary silk from mulberry leaves; the lifetime of the worms was 30 to 47 days. With mulberry food the worm of Bombyx mori required in the past century in Central Europe 40—50 days, while they now used only 29—33 days for the absorption of nourishment.

The cultivation of the new food plant salsify (Scorzonera hispanica) presents various advantages over that of the mulberry tree. The salsify plant can in the garden as well as in the open field rapidly be grown to any extent; it grows in all Europe in mountainous regions as well as in low lands; if sowed in May, a fair crop of leaves is already obtained in autumn, but an abundant yield in the spring of the next year; late frosts scarcely affect it, while with us (in Bavaria) the mulberry tree yields abundant crops of leaves only after 10 to 20 years. The frequent rains of the spring and earlier summer seasons render the feeding with mulberry leaves very troublesome; wet food causes disease among the worms, which die in great numbers; stale leaves they like not to eat. This trouble is almost entirely overcome in feeding with salsify leaves; a movable awning is constructed at a small expense from boards and sack cloth (or



WASHING AND EXTRACTING MILL—PLAN VIEW.

other material) beneath which the required quantity of food can be kept dry. Besides, when not used for sericulture, the roots of scorzonera yield food for man and the leaves for domestic animals.

On the other hand, the leaves of evergreen buckthorn are recommended as food for silk worms. This discovery was made by an American lady, who employed her leisure hours in raising silk worms and, when the uncommonly mild weather of the winter before last caused the worms to appear before the mulberry and Osage orange tree had produced any leaves, tried the buckthorn leaves with good success. When afterward one-half of the worms were fed with Osage orange leaves, and the other continued on buckthorn, the surprising result was that the latter yielded larger cocoons of finer threads than the former.

Some Telescopes in the United States.

Dr. Wm. H. Knight gives in a recent number of the *Sidereal Messenger* a list of over one hundred telescopes, with names of owners, makers, etc. The list includes only those instruments of which the aperture is four inches or upward.

The twelve largest refracting telescopes are those of the Lick Observatory with an aperture of 36 inches, Yale University 28, U. S. Naval 26, Leander McCormick 26, Princeton 23, Denver 20, Smithsonian 20, Dearborn 18·5, Carleton College 16·2, Warner 16, Washburn 15·5, and Harvard 15.

The largest reflecting telescopes are those of Harvard College, 28 inches, and Rev. Dr. John Peate, 22 Dr. Peate, who is an amateur maker, is now finishing up a 30½ inch silver-on-glass mirror, which will be presented to the Allegheny College at Meadville. When mounted it will be the largest reflecting telescope in this country. There are numerous reflectors made by Brashear from 9 to 12 inches in diameter.

The Clarks are now grinding an object glass of 40 inches for a telescope to be mounted in an observatory yet to be built upon Mount Wilson in Southern California.

Though the Lick Observatory possesses the largest telescope at present, Harvard College has the best equipped observatory for general astronomical work in America, and one of the best in the world.

In foreign countries the largest refractors are those at Pulkowa, near St. Petersburg, 30 inches, Nice 29·75, Vienna 26·75, Gateshead, near London, 25, and Paris 23 6.

The largest reflectors are those of Lord Rosse, in Ireland, 72 inches, Melbourne 48, Paris 47, Mr. Common's, in England, 37·5, another of Lord Rosse 36, Toulouse 32·4, Marseilles 31·5, Greenwich 28, and Cambridge 24.

Castor Oil and Malt Extract.

Castor oil has for many years been regarded as one of the most generally useful aperients, but its employment has been considerably limited on account of its nauseous flavor. As many experiments have been made with a view of obviating this difficulty, the idea suggested itself of employing extract of malt as a vehicle, since the extract has been found so useful in masking the taste of cod liver oil and other medicines of a nauseating character which are objected to by so many people.

The specimens presented are composed of nearly equal quantities of oil and extract of malt. They have been submitted to many therapeutists, and a general opinion has been expressed that the nauseous flavor of the oil is very little or not at all perceptible, and that no disagreeable taste is left in the mouth after the administration.

One advantage in the employment of extract of malt for disguising the flavor of castor oil is that the extract is itself a mild aperient in large doses and may be found a valuable aid in connection with the castor oil. The *rationale* is readily seen. The gum in the Mistura olei ricini tends to cause early decomposition of the preparation, whereas the pseudo-solution of castor oil in malt extract appears to keep perfectly for an indefinite period. It will be observed that the mixture is light and clear. I am not yet able to say whether the oil is actually dissolved in the extract; I hesitate to call it a solution, but the chief evidence in favor is that, as I show it, it is translucent, and upon adding to water the mixture becomes turbid and forms an emulsion. The combination is I believe well adapted for giving to children and fastidious persons, and thus assists in making the oil available to patients hitherto unable to take it.

For preparing the mixture the mortar should be first warmed and the extract of malt triturated in it until it becomes somewhat liquefied. The castor oil should then be added gradually during continuous trituration.—S. M. Burroughs in paper read before British Pharmaceutical Conference: after *Chem. and Drug.*

Fig Wine.

Figs are largely employed, especially in Algeria, for the production of fictitious wine. For this purpose figs from Asia Minor are preferred on account of their relative cheapness and richness in sugar. When the fruit is treated with a suitable quantity of tepid water, acidified with tartaric acid, fermentation rapidly commences, resulting in the production of a vinous liquid of about 8° alcoholic strength, and so inexpensive that it defies all competition of genuine grape wine, Algerian or otherwise. Fig wine cannot be distinguished either by taste or the ordinary methods of analysis from genuine grape wine, especially when it is mixed with a proportion of the latter. The detection of fig wine, however, is rendered comparatively easy by the fact that it contains mannitol. In order to separate the mannitol, 100 c. c. of fig wine are evaporated to a sirup which is allowed to stand in a cool place for 24 hours. At the end of this time the residue will have solidified, well defined groups of crystals being formed. The crystals are washed with cold alcohol of 85 per cent strength in order to remove impurities. The residue is mixed with animal charcoal and extracted with boiling 85 per cent alcohol and filtered. The alcoholic solution yields on evaporation a crystalline mass of mannitol which may be recognized by its physical and chemical properties. Certain white wines from the Gironde district, as well as raisin and some other wines, contain mannitol, but only to the extent of a few decigrammes per liter; while fig wine contains from 6 to 8 grammes per liter. By a determination of the mannitol it is possible to detect an adulteration of normal Algerian wine with one-half or even one-fourth of fig wine.—*P. Carles.*

Steam Wagons.

The owners of the San Bernardino County, Cal., iron mines, near Haslett, propose to haul ore from the mines to the railroad with steam traction engines.

The steamers were built by J. B. Osborne to haul ore 100 miles across the Mojave desert. Each engine hauls two trail wagons. The engines have 20 H. P. boilers. Auxiliary engines are placed in the trail wagons, which are connected with the forward boilers by steam pipes.

It is expected each set of wagons will make a trip every two days, hauling twenty tons of ore.